

REMARKS

Claims 1-12 are all the claims pending in the application.

Claim Rejections Under § 103

(I) Claims 1 and 2 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 07-022155 to Oshima in view of U.S. Patent No. 6,215,235 to Osamura and further in view of U.S. Patent Application Publication No. 2002/0105254 to Hori et al.

(II) Claims 4 and 5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oshima in view of Osamura in view of U.S. Patent No. 4,540,910 to Kondo et al and further in view of Hori.

(III) Claims 6 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oshima in view of Osamura in view of U.S. Patent No. 5,465,022 to Katoh et al and further in view of Hori.

(IV) Claims 3 and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oshima in view of Osamura in view of Hori and further in view of U.S. Patent No. 4,700,103 to Yamaguchi.

(V) Claims 8 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oshima in view of Osamura in view of Kondo in view of Hori and further in view of Yamaguchi.

(VI) Claims 11 and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oshima in view of Osamura in view of Katoh in view of Hori and further in view of Yamaguchi.

Applicants respectfully traverse.

The present claims recite a method for producing a spark plug whereby welding of the noble metal tip is performed in such a manner that a laser beam is applied on the whole circumference of the flange portion of the noble metal tip obliquely at an angle to both the side surface of the noble metal tip and the surface of the electrode. Namely, the laser beam is applied obliquely to the electrode through the flanged portion of the noble metal tip thereby forming a weld having a higher noble metal content (e.g., 60% or even higher), such that the noble metal tip and the electrode have a sufficiently high welding strength therebetween.

Oshima fails to disclose or suggest a method whereby the laser is applied obliquely to the noble metal tip and the electrode. Rather, Oshima discloses a method whereby the laser beam is applied to the boundary between the noble metal tip and the electrode in a direction perpendicular to the side surface of the noble metal tip. *See*, Figures 4 and 5. Thus, the noble metal tip and the electrode are equally exposed to the laser beam. Since the electrode has a lower melting point as compared to the noble metal tip, the electrode is melted to a greater extent as compared to the noble metal tip.

Hori discloses a spark plug comprising: (a) a center electrode having a tip; (b) a ground electrode having a center electrode-opposed surface facing the tip of the center electrode; (c) a noble metal member having a given length and a first and a second end opposed to each other through the length, wherein the noble metal member is joined at the first end to the center electrode-opposed surface of the ground electrode by laser welding so as to oppose the second end to the tip of the center electrode through a spark gap; and (d) a fused portion that forms a weld of the noble metal member and the ground electrode formed by materials of the ground electrode and the noble metal member melted together. *See*, paragraph [0011]. Hori further

discloses that the joining of the noble metal chip 45 to the tip 43 of the ground electrode 40 is achieved by laser welding. *See*, paragraph [0099].

The method of laser welding, according to Hori, is accomplished by (1) radiating six laser beams simultaneously to the corner 45b at fixed angular intervals (i.e., 60°) without moving them, or (2) radiating a laser beam to the corner 45b six times at an angular interval of 60° while turning the chip 45 and the ground electrode 40 together about a longitudinal center line of the chip 45. The number of laser spots may be determined as a function of the size or shape of the chip 45. *See*, paragraph [0101] and Figs. 3(a), 3(b), 4(a) and 4(b). The noble metal chip 45 has a given length and a lateral sectional area (i.e., a circular traverse area in this embodiment) of 0.1 mm² to 0.6 mm².

The laser welding method of Hori results in the formation of the fused portions 44 made up of the materials of the chip 45 and the ground electrode 40 melted together, wherein the fused portions 44 partially overlap each other around the chip 45. In addition, the method results in unfused portions 46. Thus, Hori fails to disclose or suggest a method of irradiating the whole circumference of a flanged portion of the noble metal tip, such that the noble metal content in a position far by about 0.05 mm inward a molten portion as specified becomes 60% or higher. Specifically, the above-noted limitation relating to noble metal content is only met for the combination of obliquely irradiating and using a noble metal tip having a flange portion as claimed in present claim 1.

Accordingly, even if one skilled in the art were to modify the method of Oshima to utilize the welding method of Hori, the present invention would not be obtained.

Each of Osamura, Kondo, Katoh and Yamaguchi fails to make up for the deficiency of Oshima in view of Hori. Thus, Oshima, Osamura, Hori, Kondo, Katoh and Yamaguchi fail to

render obvious the present claims. Accordingly, withdrawal of the rejections is respectfully requested.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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